

**IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF TEXAS
MARSHALL DIVISION**

CYWEE GROUP LTD.,

Plaintiff,

v.

**SAMSUNG ELECTRONICS CO., LTD.
AND
SAMSUNG ELECTRONICS AMERICA,
INC.**

Defendants.

CASE NO. 2:17-cv-00140-RWS-RSP

JURY TRIAL DEMANDED

PLAINTIFF CYWEE GROUP LTD'S REPLY CLAIM CONSTRUCTION BRIEF

Michael W. Shore
Texas State Bar No. 18294915
mshore@shorechan.com
Alfonso Garcia Chan
Texas State Bar No. 24012408
achan@shorechan.com
Christopher L. Evans
Texas State Bar No. 24058901
cevans@shorechan.com
Ari B. Rafilson
Texas State Bar No. 24060456
arafilson@shorechan.com
William D. Ellerman
Texas State Bar No. 24007151
wellerman@shorechan.com
Paul T. Beeler
Texas State Bar No. 24095432
pbeeler@shorechan.com

SHORE CHAN DEPUMPO LLP
901 Main Street, Suite 3300
Dallas, Texas 75202
Tel: (214) 593-9110
Fax: (214) 593-9111

Attorneys for Plaintiff CyWee Group Ltd.

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INDEX OF DECLARATIONS AND EXHIBITS

ITEM	DESCRIPTION
LaViola Rep. Dec.	Declaration of Joseph J. LaViola, Jr., Ph.D. in Support of CyWee's Reply Claim Construction Brief
Ex. A	Excerpts from transcript of March 9, 2018 deposition of Dr. M. Ray Mercer PhD with selected exhibits, namely Exhibit 7, available at https://en.wikipedia.org/wiki/Extended_Kalman_filter and Exhibit 8, Excerpt from Dan Simon, Optimal State Estimation (2006).
Ex. B ¹	Excerpts from Plaintiff's technology tutorial at the July 22, 2015 Claim Construction Hearing in <i>CyWee Group, Ltd. v. Apple, Inc.</i> , No. 14-cv-01853-HSG (N.D. Cal.).

¹ This exhibit is submitted solely in response to Samsung's citation of and reliance on Exhibit 5 (Dkt. 67-10) to its brief. Samsung did not specifically identify this exhibit in the parties' Joint Claim Construction Statement or otherwise previously, in violation of Patent L.R. 4-3, and CyWee objects to it.

I. TERMS ALLEGED INDEFINITE BY SAMSUNG

A. “utilizing a comparison to compare the first signal set with the second signal set”

Samsung’s allegations of indefiniteness ignore the ’438 patent’s teaching of an enhanced comparison method, in which a comparison “generally refer[s] to the calculating and obtaining of the actual deviation angles” ’438 patent 2:26-37; *see also id.* 3:62-63. As Dr. LaViola testified, the ’438 patent teaches, to a person of ordinary skill in the art, a method for dynamic estimation of orientation using an optimal estimator, such as an extended Kalman Filter (EKF). LaViola Rep. Dec. ¶ 7. Although “[t]here are a variety of implementations and modifications that can be made to EKFs for various applications” they all share a fundamental “underlying structure, methodology and mathematical theory that a person of ordinary skill in the art would recognize.” *Id.* For simplicity, Dr. LaViola referred to this class of estimators as EKFs. *Id.*

As a preliminary matter, CyWee objects to Samsung’s reliance on Exhibit 5 (Dkt. 67-10) to its brief because Samsung did not specifically identify it in the parties’ Joint Claim Construction Statement previously, in violation of Patent L.R. 4-3. Nevertheless, a presentation by CyWee and Dr. Ahamed made at that hearing described CyWee’s patented method as an “*enhanced* Kalman filter” contradicting Samsung’s allegations regarding an EKF. Ex. B at p. 26.

Samsung relies on Dr. Mercer’s testimony to support its contention that several terms are indefinite; but his ability to do so is questionable. For example, Dr. Mercer opined that a person of ordinary skill in the art would not recognize that the ’438 patent discloses elements of an EKF. Dr. Mercer has not written a single paper on Kalman filters, has no patents on such filters, has never implemented an EKF, and is not even familiar with fundamental equations underlying an EKF. Ex. A 29:5-8, 29:21-30:4, 31:4-7, 151:13-21. A person of ordinary skill in the art would be familiar with such equations. LaViola Rep. Dec. ¶ 6. In contrast, Dr. LaViola has worked with

and implemented EKF's for over 15 years and has written several papers on them. LaViola Rep. Dec. ¶¶ 3-5. Dr. LaViola squarely contradicts Dr. Mercer and testifies that several of the patent's equations are equivalent to those commonly used in an EKF. *Id.* ¶¶ 11-13.

Samsung argues this term is indefinite because it does not refer to a specific type of "axial acceleration." Neither this term nor CyWee's construction recite an "axial acceleration." And, as discussed in CyWee's opening claim construction brief, Samsung had no difficulty understanding its scope when agreeing to several other constructions. *See* Dkt. 66 at 7. Samsung's argument is akin to stating that a claim directed to a chair is indefinite because it does not state the number of legs it includes. Samsung's position is particularly unconscionable because, as Dr. LaViola testifies, the '438 and '978 patents state that there are different types of acceleration, "thus justifying the need for an 'enhanced comparison method' that can handle the measurement errors that stem from these different sources as well as other disturbances and noise." LaViola Rep. Dec. ¶ 15; *see also* '438 patent 3:9-15. Thus, the patent teaches that the second signal set, which includes acceleration, can include more than one type of acceleration.

Samsung appears to argue that the '438 patent is solely directed towards reducing noise, and that such noise does not include undesirable accelerations. But the enhanced comparison method of the '438 patent is designed to handle "**errors**" as well as noises over time associated with signals generated by a combination of motion sensors, including the ones generated by accelerometers." '438 patent 4:22-25 (emphasis added); *see also* '438 patent 3:63-66. Further, the patent explicitly discloses problems with unwanted accelerations as a problem in the *prior art*, which the patent addresses. *Id.* 2:63-3:15. Together, these disclosures demonstrate that the patent is designed to address undesirable sensor readings or disturbances. *See* LaViola Rep. Dec. ¶ 15 (confirming that the patented method can address different types of acceleration).

Samsung's caselaw is readily distinguishable. *Innovative Display Techs. LLC v. Hyundai Motor Co.*, No. 2:14-CV-201-JRG, 2015 WL 2090651, at *22 (E.D. Tex. May 4, 2015) involved the term "more in the width direction," there were different ways to understand the term, and the patent did not explicitly disclose any of them. This is unlike the '438 patent, which readily acknowledges and addresses different types of acceleration. Courts routinely hold that, where a specification explicitly discloses options within a category, a claim term directed towards the category is definite. *Accordant Energy, LLC v. Vexor Tech., Inc.*, No. 1:17 CV 411, 2017 WL 5588869, at *8 (N.D. Ohio Nov. 21, 2017) (holding "fiber" definite: "the possibility of multiple definitions does not automatically render the claim indefinite. There are often different interpretations of claim terms, which is not in and of itself grounds for invalidity."); *Veracode, Inc. v. Appthority, Inc.*, 137 F. Supp. 3d 17, 55 (D. Mass. 2015) (holding "program errors or potential program errors" definite where patent provided a non-exhaustive list of examples); *Thomas Swan & Co. v. Finisar Corp.*, No. 2:13-CV-00178-JRG, 2014 WL 2885296, at *9 (E.D. Tex. June 25, 2014) (holding claims directed towards specific types of holograms did not render the term "hologram" indefinite). *Harcot Research, LLC v. Europea Sports Prod., Inc.*, No. 2:13-CV-228-JRG-RSP, 2014 WL 5603653, at *7 (E.D. Tex. Nov. 3, 2014) is distinguishable because the term "large and rapid energy supply" provided no guidance as to its scope.

Samsung's allegation that the patent is invalid if it uses an EKF is unfounded. As Dr. LaViola testified, an EKF is a general framework. LaViola Rep. Dec. ¶ 18. Samsung bears the burden of showing that any prior art it relies on practices each claim limitation.

Samsung's allegation regarding rigid bodies is of no import. *Id.* ¶¶ 16. Dr. Mercer admitted that the 3D pointing device appears to be rigid, and he could not identify a non-rigid 3D pointing device in the patent. Ex. A 99:13-18, 106:2-5. A non-rigid body moving the 3D pointing device

would not impact the claimed enhanced comparison method, which is directed towards tracking the orientation of the device itself. LaViola Rep. Dec. ¶ 16.

Although Samsung alleges that this term is impossible to practice, Dr. Mercer's testimony is directly contradicted by Dr. LaViola, who has significantly more expertise in the relevant field. Further, if the claim were truly impossible to practice, Samsung would have no cause for concern about a finding of infringement.

B. “comparing the second quaternion in relation to the measured angular velocities ω_x , ω_y , ω_z of the current state at current time T with the measured axial accelerations A_x , A_y , A_z and the predicted axial accelerations A_x' , A_y' , A_z' also at current time T”

Samsung argues that this term is indefinite for the same reasons as the term discussed in § I.A. The term is not indefinite for the reasons discussed above and in CyWee's prior brief. *See* Dkt. 66 at 11-13. Samsung further argues that the term “predicted axial acceleration”—which does not appear in the prior term—is indefinite. CyWee's arguments for acceleration in general, as discussed in § I.A, apply here as well. *See* LaViola Rep. Dec. ¶¶ 20-22.

In addition, Samsung and Dr. Mercer fails to recognize that Equations 2-4 provide an embodiment having a predicted axial acceleration, which is derived from the second quaternion that is computed from Equation 1, and this quaternion is derived from the first quaternion and the measured angular velocities. LaViola Rep. Dec. ¶ 23; *see also* '438 patent Figs. 7, 8.

Because the predicted axial acceleration is derived from the second quaternion in this embodiment, a person of ordinary skill in the art would understand that the second quaternion is normalized so that it represents orientation, and that the predicted axial accelerations would represent only axial accelerations that stem from gravity (since gravitational acceleration is used to determine orientation). *Id.* There would be no linear or centrifugal acceleration components as part of the predicted axial acceleration. *Id.* Thus, Samsung's allegation is false, and even if it

were not, as Dr. LaViola testified, the enhanced comparison method would address the different types of acceleration. *Id.*

C. “generating the orientation output based on the first signal set, the second signal set and the rotation output or based on the first signal set and the second signal set”

As with the terms above, Samsung’s arguments regarding axial accelerations are refuted in the preceding sections, CyWee’s preliminary claim construction brief, and Dr. LaViola’s declarations. Samsung and Dr. Mercer further argue that it is impossible to generate an orientation output based on a set of axial accelerations and the output of a magnetometer when the 3D device is moving. Dr. Mercer’s testimony is based on a fundamental misunderstanding of an EKF and its variants. LaViola Rep. Dec. ¶ 25. As Dr. LaViola testifies, a person of ordinary skill in the art could look at Equations 5-11, which describe an enhanced comparison method, and use that method as a blueprint to compute deviation angles of the 3D pointing device when using axial accelerations and magnetometer information to generate orientation information for a moving object. *Id.* ¶¶ 25-28.

II. ADDITIONAL TERMS

A. “three-dimensional (3D) pointing device”/“3D pointing device”(’438 and ’978 patents)

Samsung contends that CyWee’s proposed construction would encompass “any device that determines deviation angles or the device’s orientation.” Dkt. 67 at 21. On the contrary, CyWee’s constructions are limited to a *handheld* device comprising *specific* sensors. Samsung does not dispute those requirements. Rather, the parties’ disagreement centers around whether the device must display a “cursor or pointer on a display” as Samsung incorrectly suggests.

Samsung first cites the prior art references contained at Figures 1 and 2 of the patents to argue that a 3D pointing device must translate motions to a cursor on a display. Dkt. 67 at 22. Such a construction would exclude the disclosed embodiments of the patents and would be

inconsistent with their descriptions. For instance, although Samsung cites Figures 5 and 9 to suggest that movement of the pointing device must be represented by a cursor on a screen, Samsung admits that tracking movement in such a manner is *optional*, not *mandatory*.²

Samsung's attempt to reconcile its proposed constructions with Figures 7 and 8 is also misguided—whereas Samsung suggests that neither of those figures “eliminates the requirement that the ‘3D pointing device’ perform a pointing function” (Dkt. 67 at 26), neither of the figures require the presence of a cursor or pointer on a display. Figure 7 does not require any information to be displayed at all. And Figure 8 only adds a step allowing display data to be translated into a “movement pattern in the display reference frame,” which obviously does not require displaying a pointer or cursor.

Similarly, Samsung largely ignores the significance of Figure 6. Displaying a “movement pattern” in no way suggests that a pointer or a cursor is required. That figure depicts an embodiment which includes a 3D pointing device that is integrated with a smartphone. This embodiment obviously does not require a pointer or cursor to be displayed on the screen to track the device's orientation. The '438 patent discloses that such a device *may* map orientation to show movement pattern on a display, but this is not limited to a cursor or pointer.

Although Samsung argues that its proposed terms “cursor” and “pointer” are not as limited as CyWee suggests, it heavily relies upon a case that states exactly that—*SyncPoint Imaging* involved claim language that required a cursor, and defined the term as “a *visible mark* that is generated by the computer and that indicates a position on the display.” *SyncPoint Imaging, LLC*

² Samsung cites to dictionary definitions of “pointing device” to imply that the inventions require the movement of a visible mark or cursor on a screen. Contrary to those definitions, which are obviously based upon traditional pointing devices (such as a laser pointer or computer mouse), the patented inventions describe something different—a 3D pointing device capable of generating orientation information without the necessity of displaying that information.

v. Nintendo of Am. Inc., No. 2:15-cv-00247-JRG-RSP, 2016 WL 55118, at *9 (E.D. Tex. Jan. 5, 2016) (emphasis added).³ Here, certain embodiments of the patents would not benefit from a visible cursor at all, while other embodiments clearly do not **require** one. Samsung acknowledges as much, insofar as it admits that “[t]he display device **may** display a cursor or some video effect to highlight the position of the target point 924.” (emphasis added).

Samsung also cites the ’978 patent’s specifications in an attempt to distinguish a “3D pointing device” from other devices such as a smartphone or navigation equipment. But that cited specification plainly claims a need for a “device ... capable of accurately outputting a deviation of such device readily useful in a 3D or special reference frame,” regardless of the nature of the device. ’978 patent, 3:63-4:4. As Dr. LaViola confirmed, a 3D pointing device may **include** other devices such as a smartphone or navigation equipment.⁴ Dkt. 67-9 167:21-168:7. Dr. LaViola did not testify that a 3D pointing device **must** display a cursor or pointer—his opinion is that the term may support a variety of activities such as pointing **or** providing direction and/or orientation information. Dkt. 67-9 157:16-158:7. Indeed, the title of each of the patents-in-suit recites a “3D Pointing Device” suggesting that **all** embodiments in the patent (none of which **require** a visible pointer or cursor) are included within the scope of such a device.⁵

B. “six-axis motion sensor”/“six-axis motion sensor module”

Samsung’s close-ended construction ignores that the patent repeatedly uses the open-ended

³ Samsung’s other cases are likewise distinguishable. For instance, the handheld device in *UltimatePointer, L.L.C. v. Nintendo Co.*, 816 F.3d 816, 825 (Fed. Cir. 2016) was construed as directed to a “direct pointing system” because the title recited a “direct pointing system” and there were no embodiments that would be excluded by such a disclosure.

⁴ The ’978 patent confirms this because it refers to the embodiment of Figure 6 as a “3D pointing device” such as “a smartphone or navigation equipment.” ’978 patent 8:40, 13:5-6.

⁵ Additionally, every asserted claim of the ’978 patent requires a transformed output, which requires generation of information to be displayed. This strongly implies that the claims of the ’438 patent claims do not contain such a limitation.

terms “comprising” and “including” when describing the six-axis motion sensor. Samsung also ignores that the patent discloses a PCB that can include other components in addition to the ones that are required. And Samsung never addresses the ambiguity caused by its inclusion of the term “module,” which unnecessarily implies that the sensors must be tightly integrated, rather than separated on a common PCB with other components, as shown in the figures for the ’438 patent.

Samsung cites the file wrapper for the ’978 patent to support its argument. At most, the file wrapper of the ’978 patent is *extrinsic* evidence that illustrates nothing other than the differences between the two patents. *See Phillips v. AWH Corp.*, 415 F.3d 1303, 1317 (Fed. Cir. 2005). As Dr. LaViola, testified, the text Samsung relies on merely confirms that the ’978 patent requires a magnetometer and measured output, while the ’438 patent does not. LaViola Dec. ¶ 29. This is in no way a clear disavowal of the ’438 patent’s scope. *See Smartphone Technologies LLC v. HTC Corp.*, No. 610cv580LEDJDL, 2013 WL 1136972, at *8 (E.D. Tex. March 18, 2013) (holding that nothing in child application “explicitly and unambiguously” narrowed the scope of parent application); *Albany Molecular Research, Inc. v. Dr. Reddy’s Laboratories, Ltd.*, No. 094638, 2010 WL 2516465, at *4 (D. N.J. June 14, 2010) (holding that pointing out differences between claims in response to double patenting rejection is not a “‘clear disavowal’ of claim scope”).

C. “global reference frame associated with Earth”

Samsung’s allegation that under CyWee’s construction three coordinate axis are not required is false because the longer phrase of which this term is a part: “*three coordinate axes* of a global reference frame associated with Earth” clearly requires three axes. (emphasis added).

Samsung alleges its construction “conforms to the terms commonly understood meaning” and “the extrinsic evidence uniformly” supports its construction. But the only extrinsic evidence of record on how a person of ordinary skill in the art would understand the *specific terms* “global

reference frame” and “global reference frame associated with Earth” is from CyWee’s expert. LaViola Rep. Dec. ¶¶ 30; Dkt. 66-6 ¶¶ 108-111; *See Key Pharm. v. Hercon Labs. Corp.*, 161 F.3d 709, 716 (Fed. Cir. 1998) (“[A] trial court is quite correct in . . . relying on expert testimony on an ultimate claim construction question in cases in which the intrinsic evidence . . . does not answer the question.”). According to Dr. LaViola, the term “global reference frame” is a “commonly used term of art, which refers to a fixed frame, against which the position and orientation of moving frames can be measured.” LaViola Rep. Dec. ¶ 30. Samsung did not submit expert testimony on this term or ask Dr. LaViola about it during his deposition. Further, as Dr. LaViola testifies, CyWee’s construction does not eliminate the term “global” simply because it allows for an origin other than the center of the globe. *Id.* ¶ 32.

Samsung attempts to equate the claimed frame with a specific type of frame known as a “Earth-Centered Earth-Fixed Frame” or “Earth frame.” The claims and specification do not use either term, and the Applicant provided no indication that it wanted to limit the scope of this claim to such a frame. The claim language demonstrates that the reference frame must simply be “associated with the Earth.” Evidence submitted by both parties provides examples of frames associated with the Earth that do not have an origin at or near the center of the Earth. Dkt. 66-5 § 2.2.3⁶ (describing ENU (East-North-Up) frame); Dkt. 67-15 § 2.1.3 (frame local navigation frame). For example, Samsung’s reference discloses a local navigation frame in which the origin is not at or near the center of the Earth, and one of the axes points “roughly toward the center of the Earth.” Dkt. 67-15 § 2.1.3. Samsung does not and cannot deny that these frames are associated with the Earth. Samsung has not identified a clear disclaimer supporting its overly narrow construction, and its construction should be rejected.

⁶ CyWee’s opening claim construction brief erroneously referred to § 2.2.2 for the ENU frame, but Dr. LaViola’s original declaration correctly referred to § 2.2.3. *See* Dkt. 66-6 ¶ 110.

D. “using the orientation output and the rotation output to generate a transformed output associated with a fixed reference frame associated with a display device”

Samsung argues that the transformed output is simultaneously (1) a *variable* and (2) a *two-dimensional vector* representing two-dimensional movement. Samsung’s construction does not require a variable or a vector, and instead states that the transformed output *represents* a two-dimensional movement. Samsung’s construction is directed to the *type of movement* a transformed output *represents*, not whether it is represented by a variable or two-dimensional vector. Because the pointing device itself moves in three dimensions, restricting the transformed output to solely represent two-dimensional movement is overly restrictive.

Samsung’s construction and its purported support for its allegations regarding a two-dimensional vector or variable representing two-dimensional movement come solely from a single embodiment in which the pointing device is separate from the display. Applying that limitation to all embodiments of the patent, absent a clear disclaimer or other indication that the Applicant intended to limit claim scope, is improper. *Retractable Techs., Inc. v. Becton, Dickinson & Co.*, 653 F.3d 1296, 1306 (Fed. Cir. 2011). Further, it is questionable as to whether the embodiment Samsung relies on is limited to a vector. The embodiment refers to a “rotation vector” demonstrating the Applicant’s knowledge of the term; yet the patent never refers to the transformed output as a vector. *See* ’978 patent 13:37-14:3. The danger of adopting Samsung’s construction is that it could easily be read to exclude a two-dimensional representation of movement in three dimensions, which is contrary to the teachings of the ’978 patent.

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Respectfully submitted,

/s/ Ari Rafilson

Michael W. Shore

Texas State Bar No. 18294915

mshore@shorechan.com

Alfonso Garcia Chan

Texas State Bar No. 24012408

achan@shorechan.com

Christopher L. Evans

Texas State Bar No. 24058901

cevans@shorechan.com

Ari B. Rafilson

Texas State Bar No. 24060456

arafilson@shorechan.com

William D. Ellerman

Texas State Bar No. 24007151

wellerman@shorechan.com

Paul T. Beeler

Texas State Bar No. 24095432

pbeeler@shorechan.com

SHORE CHAN DEPUMPO LLP

901 Main Street, Suite 3300

Dallas, Texas 75202

Tel: (214) 593-9110

Fax: (214) 593-9111

Attorneys for Plaintiff

CyWee Group Ltd.

CERTIFICATE OF SERVICE

The undersigned certifies that all counsel of record who are deemed to have consented to electronic service are being served with a copy of this document via the Court's CM/ECF system per Local Rule CV-5(a)(3) on March 21, 2018.

/s/ Ari Rafilson

Ari Rafilson